

THE 29TH



INTERNATIONAL SUSTAINABLE
DEVELOPMENT RESEARCH SOCIETY **ISDRS**
Conference

ECOLOGICAL RESTORATION OF URBAN LAKES THROUGH SYNTHETIC SEED-BASED PHYTOREMEDIATION: INSIGHTS FROM ISLAMIC ETHICS



PRESENTER: QURRATU AINI MAT ALI
INSTITUT ISLAM HADHARI, UKM
TS. DR. FARAH AYUNI MOHD HATTA
PROF. TS. DR. RASHIDI OTHMAN
DR. WAN SYIBRAH HANISAH
DR NUR HANIE ABD LATIFF
DR RAZANAH RAMYA

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Report cites storm-water pollution rise

By LINDA COBRO
The Free Press Times Staff Writer

Clearwater - Urban storm water run-off rapidly is becoming the major source of water pollution in the county, as reported by the Pinellas County Environmental Assessment Task Force yesterday.

The report, presented to the Pinellas Planning Council Wednesday, says that all of the salt-water and most of the fresh water bodies in the county are under stress from urbanization. It recommends strengthening characterization of storm-water directly from lakes and bays and placing more reliance on water treatment and preservation of vegetation to allow water to percolate naturally through the soil or seepage.

RICHARD FRIEDMAN, a county planner, said that urban storm water pollution was presented in the study - an age-efficient, downtown from industry, dredging and filling, and river water runoff. Friedman said that as a result of the so-called Miami Urban Law requiring advanced treatment of sewage, removal of effluent in the western body of water is shifting toward land disposal through methods such as spray application. He estimated that in the 1970s the level of water pollution will decline 80 per cent as a direct result of the law. In addition, Friedman said, industrial pollutants are being carefully regulated, reducing their impact on water and "are keeping our fingers crossed, but we believe that the days of rampant chemical waste are gone."

HOWEVER, lake efforts are being aimed toward control of runoff, he said, which can contain 90 per cent as much pollution as untreated sewage. "By the year 2000 the level of pollution running into our bays from runoff will take care of all the gains we've achieved over through advanced sewage treatment and reduction of industrial pollution," he said. The study cites Lake Maggiore as the most polluted in the county, with 61 of its 85 feet choked by organic sediments. Lake Seminole and Alafia Lake are under stress and suffering in the

WORLD'S WATER POLLUTION CRISIS



Water pollution is a global problem that affects billions of people. The image shows a person standing in a polluted body of water, highlighting the severity of the crisis.

The world's water pollution crisis is a global problem that affects billions of people. It is caused by a variety of factors, including industrial discharge, agricultural runoff, and urban sewage. The pollution of water bodies has led to a decline in water quality, which in turn has led to a decline in the health of the people who depend on the water for drinking and other uses. The crisis is particularly acute in developing countries, where water pollution is often a major public health problem.



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Get to bottom of lake pollution, DBKL told

Kepong Me...

8 NEWS

A water pollution time bomb

Alarmed specialists by Dubai's water security is not so much threatened by scarcity as by upstream pollution - much of it emanating from Tehran's city of 10 million. Fred Kocott and Shobana Peggall report

Water pollution in the city is a major concern for the Dubai Water Authority (DWA). The authority has been working to improve water quality in the city, but it is facing a major challenge in the form of upstream pollution from the city of Tehran. The pollution is a result of industrial and domestic waste that is being discharged into the city's water supply. This is a major concern for the DWA, as it is responsible for providing clean water to the city's residents.

CHOPPY WATERS

POLLUTION

- Less flow in the river is one of the major reasons for pollution in the Yamuna, both experts and a Monitoring Committee appointed by the NCT stated

DEADLINES MISSED

- A study ordered by the National Mission for Clean Ganga (NMCG), based on which a decision is to be taken on whether flow in the river should be increased
- Works to rejuvenate water bodies, which will recharge groundwater and then feed the river
- Project to build off-channel reservoirs to store water along the river, which can be used



The Yamuna river in Delhi is facing a major crisis due to pollution and low flow. The image shows a person standing in the polluted water, highlighting the severity of the situation.

RIISING TOXIN LEVEL

The unidentified pollutants found in Yamuna pose threat to liver, respiratory tract and cellular functions of human beings, say doctors.

Jal Board scientists, who conducted a chlorination study on Yamuna water, said high dose of chlorine should be required to decontaminate these pollutants.

Doctors claim that these are some of the most dangerous natural call for on them



The Yamuna river in Delhi is facing a major crisis due to pollution and low flow. The image shows a person standing in the polluted water, highlighting the severity of the situation.

LAKE'S CAPACITY HAS SHRUNK: PANEL

What the NGT commission set up in May to study lakes found

Bellandur lake has caught fire 12 times since the first incident on August 12, 2016

Water storage capacity of the lake has reduced from 19.7ml/cubic metre in 1973 to 5.5ml/cubic metre in May 2018. Rest taken up by sediments and slush

Despite there being so many polluted water bodies, Bellandur seems to have become everyone's favourite, including the NGT's, but we have no problem with that. We are doing what we can Mahendra Jain | URBAN DEVELOPMENT DEPARTMENT

DOMESTIC SEWAGE POISONING WATER

75-80% of water pollution by volume is from domestic sewage

Estimated sewage generation from class-I cities and Class-II towns | 38,254.82 MLD

Of this, only 38% or 11,787.38 MLD is being treated

The remaining is disposed directly into water bodies, polluting three-fourth of our surface water resources

MLD=Million litres per day Source: Report by WaterAid India

Untreated sewage flowing into water bodies has doubled from around 12,000 MLD to 24,000 MLD in class I and II towns between 1991 and 2008

There were 269 sewage treatment plants with 211 in class I cities, 31 in class II towns, and 27 in other smaller towns

Treated water is released into Musi, resulting in a mix of untreated and treated water

Mixed water used for farmers for irrigation of crops

Paddy in Perazhiguda, city outskirts

Farmers weighing harvests of paddy on Musi river bank

During irrigation, chemical contaminants in the treated wastewater seeps into ground

Contaminants include mercury, lead, chromium

HC DIRECTIONS

1 AMC to block three outlets, identify sources in societies and units that release contaminated sewage water into river

2 AMC to undertake extensive survey of all residential societies/buildings/units that do not have valid drainage connection

3 AMC to report what it will do to residential societies/buildings/units that do not have drainage connection

4 AMC to prepare action plan to avoid discharging some quantity of untreated sewage directly into the river

5 AMC to intensify drive to identify industrial connections illegally linked to the sewer

6 GPCB to ask NEERI to speedily prepare its report on 7 CETPs and furnish it in two weeks so that necessary repairs may be taken

CITY GROUNDWATER BEING POLLUTED

MULTIPLE SEWAGE TREATMENT PLANTS ALONG MUSI

Secondary treatment of sewage instead of recommended Tertiary treatment

Treated water is released into Musi, resulting in a mix of untreated and treated water

Mixed water used for farmers for irrigation of crops

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May 19, 2017/TNS

Thousands of fishes found dead in Rewalsar Lake

The Rewalsar Lake in Himachal Pradesh is facing a major crisis due to pollution and low flow. The image shows a person standing in the polluted water, highlighting the severity of the situation.

Antibiotics poisoning Yamuna water

Researchers Say Drugs May Be Behind Spike In Diabetes, Cancer

DANGER ELEMENTS IN RIVER

Antibiotics are being discharged into the Yamuna river, which is causing a major crisis. The image shows a person standing in the polluted water, highlighting the severity of the situation.

Klang Valley's water supply at risk

Rivers exposed to pollution due to uncontrolled development, says expert

Multiple of river pollution in Selangor

The Klang Valley is facing a major crisis due to pollution and low flow. The image shows a person standing in the polluted water, highlighting the severity of the situation.

Water pollution in the Klang Valley is a major concern for the authorities. The image shows a person standing in the polluted water, highlighting the severity of the situation.

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GUNDLAPPOCHAMALLY

RESIDENT SPEAK

Cheruvu is stinking due to the discharge of sewage water into the lake. The municipality fails under labour minister CM Mulla Reddy's assembly constituency but efforts to improve the sewage system have been lacking. We have supported TRS in every election but nothing has been done for Gundlapochamally - I Kallidas

Cheruvu has been polluted due to sewage. Elected representatives have assured that they would implement a comprehensive sewerage system, but this has not been done. The image shows a person standing in the polluted water, highlighting the severity of the situation.

Shivapura-Nelag Lake is going the

Encroachment, waste dump

The Shivapura-Nelag Lake is facing a major crisis due to pollution and low flow. The image shows a person standing in the polluted water, highlighting the severity of the situation.

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DUMPING GROUND FOR SEWAGE, FILTH

At least four arches of Madhav Arch bridge, near City College, are clogged with garbage

White foam can be seen in the area where rubber dam is constructed

Even at Purattal, heaps of garbage in the river welcome

A garbage "transit" point is in limebase stand, where garbage unloaded

City dark black sewage can be seen everywhere in the river

Musi is one of the most polluted rivers in India

Despite Musi's water and scores of

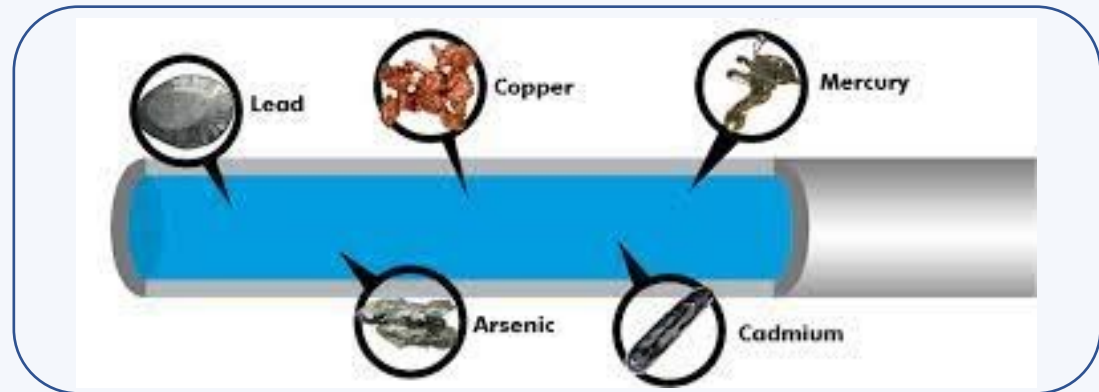
The Musi river in Chennai is facing a major crisis due to pollution and low flow. The image shows a person standing in the polluted water, highlighting the severity of the situation.

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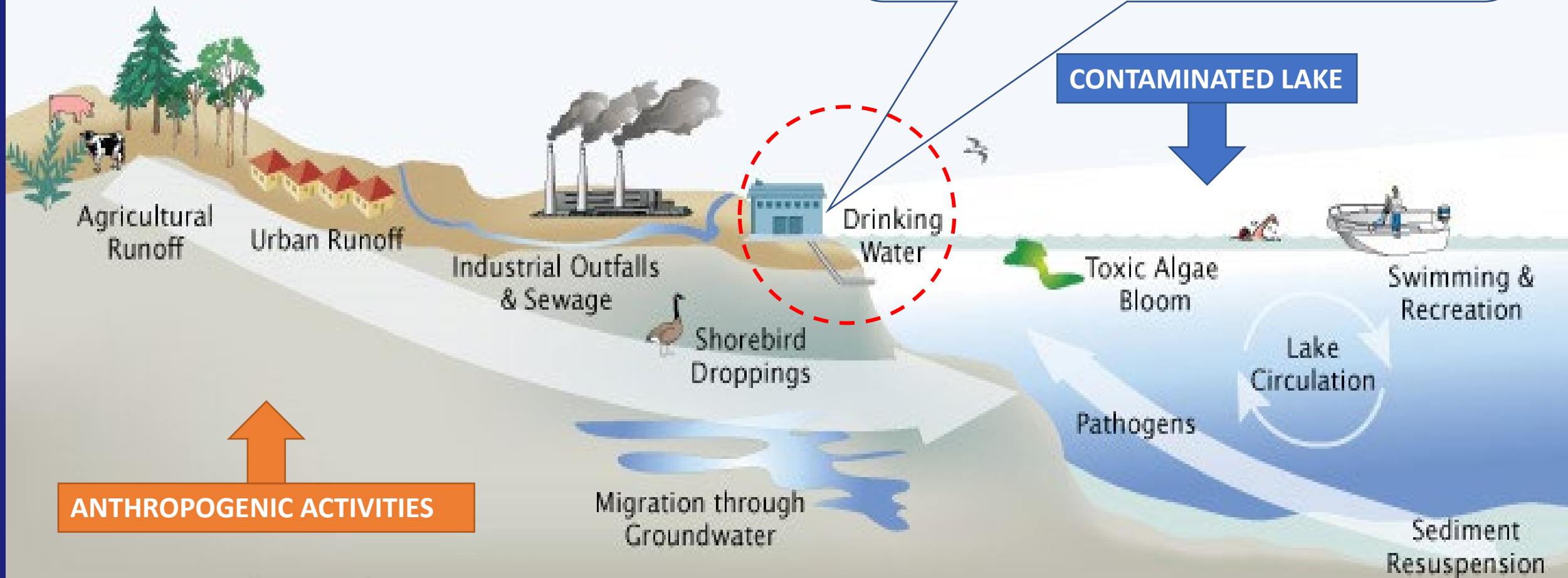
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THE "CULPRIT"



CONTAMINATED LAKE



WHAT HAPPENED??



Arsenic

Skin lesions
Hearing loss
Blood & heart diseases
Bladder damage



Mercury

Lung damage
Visual impairment
Eczema
Oral lichen



Lead

Neurological diseases
Kidney damage
Hypertension
Infertility



Cadmium

Kidney diseases
Lung damage
Bone & joint damages
Bronchiolitis



PHYTOREMEDIATION

“A current *in situ* technology that utilizes plant species for heavy metal remediation towards water, soil, and air significantly as a way to preserve the environment, human health, plants and animals”



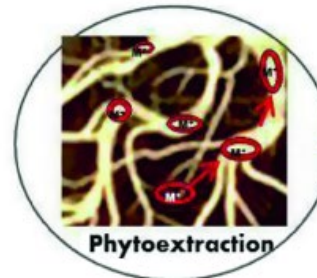
PHYTOREMEDIATION

MECHANISMS

Metal contaminants
chelation/solubilization
by leaves



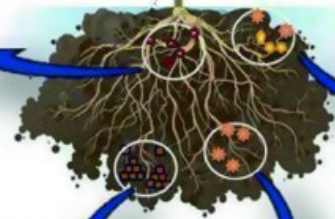
Metal contaminants
chelation/solubilization
by root



Metal contaminants
immobilization, toxicity
reduction

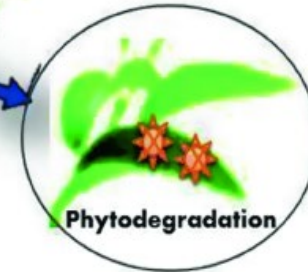


Uptake

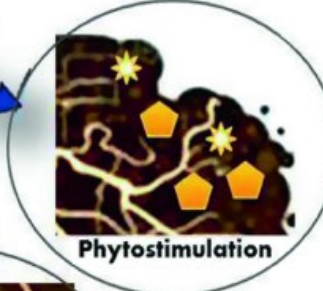


Convert metals into less
toxic and volatile forms

Use of plants to destroy
metal contaminants



Degrade organic
pollutants by plant root
exudates



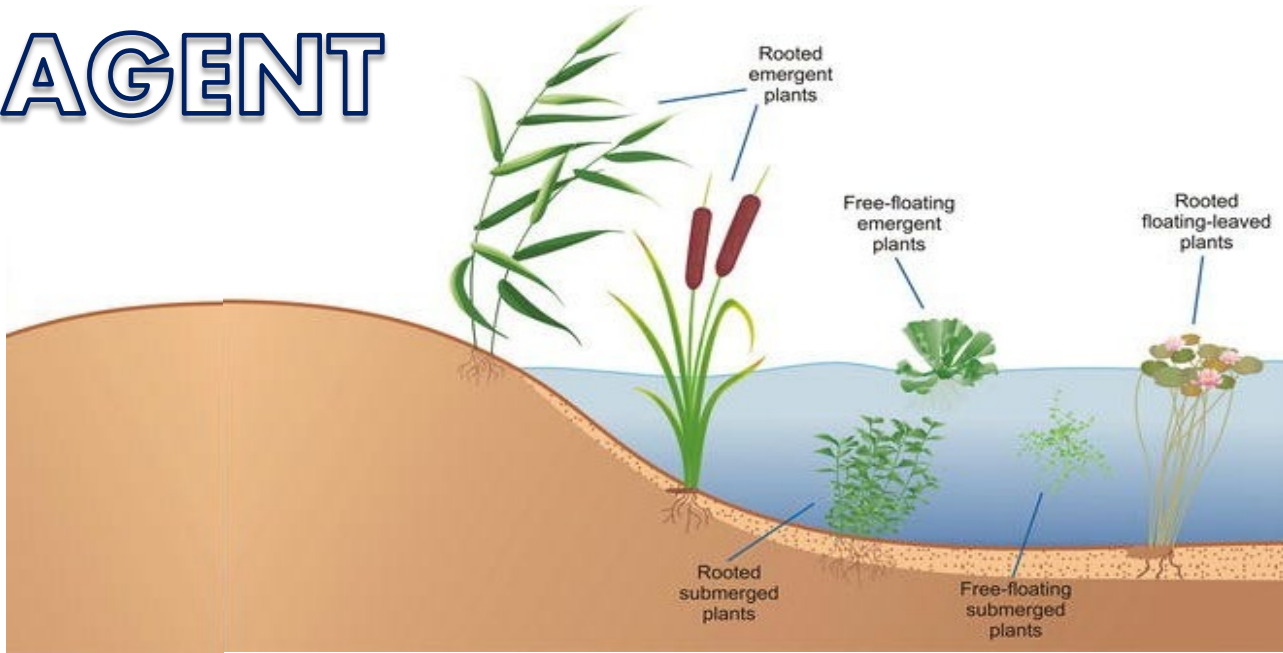
Attenuation of organic
contaminants into less toxic



AQUATIC PLANTS

PHYTOREMEDIATION

AGENT



Aquatic plant	Category	Heavy metal	References
<i>Glossostigma elatinoides</i>	Submerged	Al, Cd, Cu, Fe, Mn, Mg	Mat Ali (2016); Othman et al. (2015)
<i>Ceratophyllum demersum</i>	Submerged	Cu, Fe, Ni, Zn, Mn, Pb	Al-Ubaidy & Rasheed (2015); Borisove et al. (2014)
<i>Elodea canadensis</i>	Submerged	Cd, Pb, Zn, Cu	Basile et al. (2012); Prasad (2019)
<i>Bacopa caroliniana</i>	Emerged	Al, Fe, Mn, Mg, Pb	Hoch & Bruce (2019); Mat Ali (2016)
<i>Nasturtium officinale</i>	Emerged	Cd, Cr, Co	Duman et al. (2009); Uddin et al. (2021)
<i>Leptodictyum riparium</i>	Emerged	Cd, Pb, Zn, Cu	Basile et al. (2012)
<i>Phragmites australis</i>	Emerged	Cd, Co, Cu, Ni, Pb, Zn	Kamel (2013); Prasad (2019); Wani et al. (2017)
<i>Typha domingensis</i>	Emerged	Cd, Co, Cu, Ni, Pb, Zn	Kamel (2013); Wani et al. (2017)
<i>Neptunia oleracea</i>	Floating	As, Cd, Cu, Pb	Atabaki et al. (2020); Uddin et al. (2021); Wahab et al. (2014)
<i>Nelumbo nucifera</i>	Floating	As, Cd, Cu, Pb	Ebrahimpour & Mushrifah (2008); Luo et al. (2017); Uddin et al. (2021)
<i>Lemna minor</i>	Floating	Cd, Pb, Zn, Cu	Basile et al. (2012); Prasad (2019)
<i>Myriophyllum spicatum</i>	Floating	Cd, Co, Cu, Ni, Pb, Zn	Kamel (2013); Wani et al. (2017)
<i>Eichhornia crassipes</i>	Floating	Cd, Co, Cu, Ni, Pb, Zn	Kamel (2013); Prasad (2019); Wani et al. (2017)
<i>Lemna gibba</i>	Floating	Cd, Co, Cu, Ni, Pb, Zn	Kamel (2013); Prasad (2019); Wani et al. (2017)

SUBMERGED



EMERGED

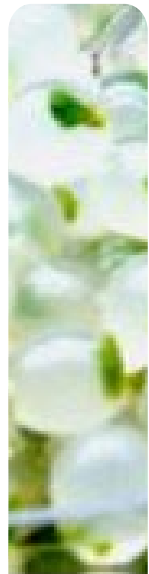
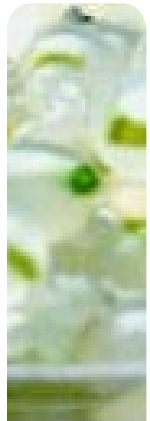
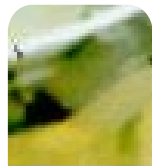
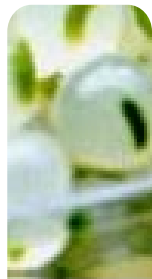
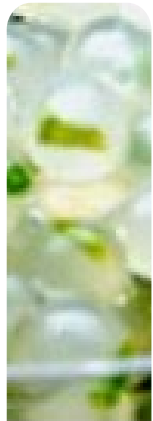


FLOATING



SYNTHETIC SEED-BASED TECHNOLOGY

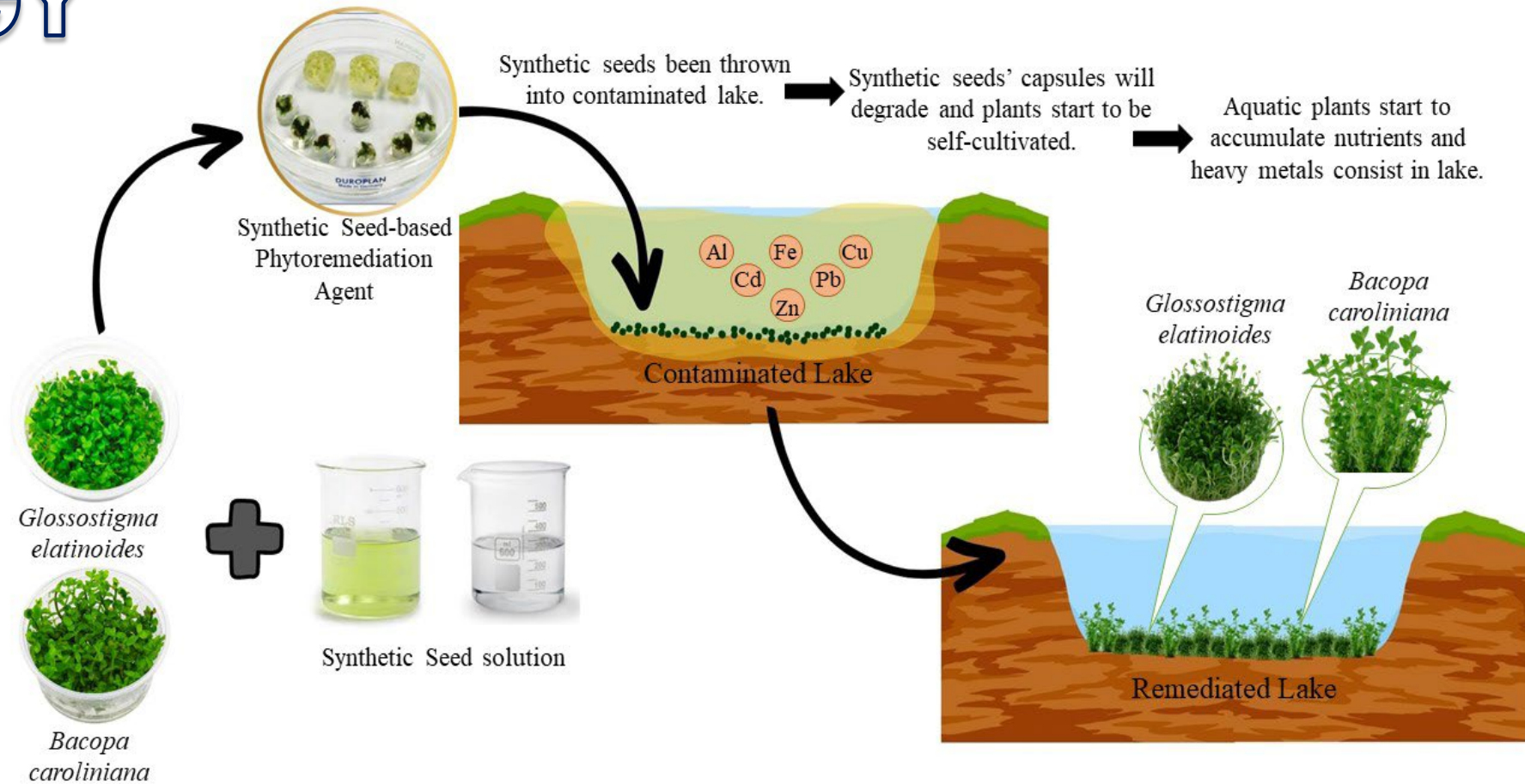
“An advanced technique that uses **encapsulated meristematic tissues like shoot buds or somatic embryos, provides long-term storage capacity, easy handling, economical mass propagation, and an environmentally friendly **approach to delivering phytoremediation plants**”**



POTENTIAL AQUATIC PLANTS FOR SYNTHETIC SEED-BASED TECHNOLOGY

Special Features:

- ✓ Small size (3-30cm)
- ✓ Fast-growing
- ✓ Survive in min sun/CO₂
- ✓ Spread with shoot & stem
- ✓ Temperature 20-27°C
- ✓ pH 5-8 (suitable for Lakes)
- ✓ Accumulate: Al, Cd, Cu, Fe, Mn, Mg, Pb



* Small sizes plant: easy encapsulation and storage, easy to cultivate and re-plant, and able to grow with non-supervision at the end stage.

(Hoch & Bruce 2019; Mat Ali 2016; Othman et al. 2015)

ISLAMIC ETHICS ON ENVIRONMENTAL RESTORATION

Allah has bestowed upon humans unique and distinctive qualities that distinguish them from other creatures. With these qualities comes the responsibility to protect and preserve the environment. The **Quran and Sunnah provide comprehensive guidelines** that serve as a source of guidance for all humans, particularly Muslims. Human obligations as Khalifah (vicegerent) on Earth are to carefully assess our **actions and behaviors towards the environment**, following Allah's commands.

When your Lord said to the angel, "I am going to place a successive (human) authority on earth." They asked (Allah), "Will You place in it someone who will spread corruption there and shed blood while we glorify Your praises and proclaim Your holiness?" Allah responded, "I know what you do not know,"

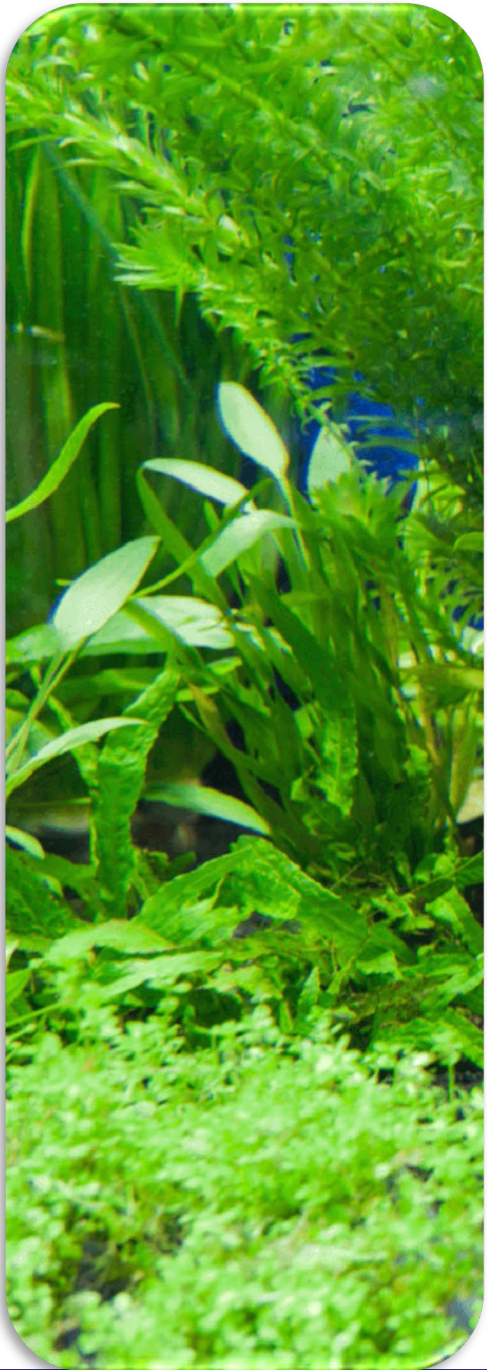
(Al-Baqarah 2:30)

Our approach should not solely focus on benefiting and satisfying human needs. Instead, we must strive for a **harmonious coexistence with other living beings, ensuring a balanced and improved living environment for all.**



CONCLUSION

- The application of synthetic seed-based technology is a promising alternative in **phytoremediation** to **improve water quality**.
- It is crucial to exercise careful **selection of efficient plant species** to minimize any potential adverse effects on the growth of surrounding plants.
- The selection process plays a vital role in **maximizing the decontamination capacity** of plants, particularly in the uptake of heavy metal contaminants.
- In-depth studies of the effectiveness of this technology could contribute to **long-term urban lake management** in terms of ecological, economic and social benefits.





~ Thank you ~